DOCUMENT RESUME

ED 253 205 IR 011 481

AUTHOR Durbridge, Nicola
TITLE Design Implications of Audio and Video Cassettes. I.E.T. Paper on Broadcasting No. 222.
INSTITUTION Open Univ., Walton, Bletchley, Bucks (England). Inst. of Educational Technology.
PUB DATE [83]
NOTE 41p.; Best copy available.
PUB TYPE Viewpoints (120) -- Reports - Descriptive (141)

EDRS PRICE MF01 Plus Postage. PC Not Available from EDRS.
DESCRIPTORS *Audiotape Cassettes; Correspondence Study; *Distance Education; Foreign Countries; Higher Education; Instructional Design; *Intermode Differences; Material Development; *Media Selection; *Videotape Cassettes
IDENTIFIERS *Open University (Great Britain)

ABSTRACT

This discussion of the educational potential of audiotape and videotape cassettes in distance teaching considers each medium individually, with examples of how the Open University has tried to exploit them in its teaching, and comments on some major differences between the two media and their implication for education. Characteristics of audiocassettes are addressed first, including their ability to convey certain kinds of abstract information quickly, their informality and flexibility, and the relative ease of their design and production for academic staff. Potential educational applications noted include their use for direct teaching, as support material (either to other components or to students themselves), as an audio resource, and for delivering straight talks. In considering video, the content and structure of one Open University video program is described. Aimed at teachers, this program used real-life school scenes of children learning mathematics. Other educational uses of video are considered, and it is concluded that video can work as a catalyst for group discussion, and that videos that are designed to use the "stop-start" capabilities of the technology will be effective for individual use by students. An analysis of the differences between audio and videocassettes indicates that audiocassettes are currently more valuable as an educational tool. (LMM)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED253205

U.S. DEPARTMENT OF EDUCATION
NATIONAL INSTITUTE OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

X This document has been reproduced as received from the person or organization originating it.

[ ] Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official NIE position or policy.

Design Implications of Audio and Video Cassettes

Nicola Durbridge
Research Fellow
I.E.T.

"PERMISSION TO REPRODUCE THIS MATERIAL IN MICROFICHE ONLY HAS BEEN GRANTED BY

A.W. Bates

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

IR011481

Abstract

A paper presented as a talk to Norwegian Correspondence Schools on the use of audio and video cassettes in distance teaching. The first section discusses the characteristics of audio-cassettes, and gives examples of how these may be exploited in an educational context.

The second section focuses on video cassettes. One example of an O.U. video provides the basis for a discussion of differences between two kinds of video user - groups and individuals. Two clear routes for future videos are noted. Finally, the paper comments upon some major differences between audio and video cassettes and their implication for education.

Introduction

This paper looks at two media: audio and video cassettes. What I shall be discussing is the educational potential of each, ways we have used them at the Open University (and here I shall give a few examples) and I shall be pointing out similarities and differences between the two media.

May I start however, by mentioning an important feature of Open University courses: it is that the University has always used a range of media to perform its teaching. Students on any one course might learn with a mixture of text, television, radio, audio cassettes and tutorials. It is text however, which usually carries the major teaching role; the other media are integrated into courses ideally just where they can make their most telling contributions.

There are probably several reasons why text has played this leading role at the OU. Among them I would include tradition and familiarity, with the medium. Added to this, for academics the preparation of a teaching text is essentially a private business and one which requires little or no help from advanced and perhaps threatening technologies. For students, too there are advantages to text, such as the permanent record it provides of what they are expected to learn, or the way it lends itself to individual and preferred study techniques such as skim reading, underlining and the making of marginal comments.

Limitations to Text

Nevertheless, text has its limitations. For example, it is not always a very efficient medium for teaching students how to carry out or practice certain skills. Here students often need to have their eyes and hands free to gain the practical skill involved. They cannct read a written instruction at the same time and so have to go back and forth from the text and to their task. It can be a cumbersome process.

Texts have other disadvantages. For example, it can be ambiguous, it can be dry and it can be very tiring and tedious to have to concentrate for long periods upon several pages of print. Most Open University authors build in questions for students to tackle as they read, both to break up the text somewhat and of course to try and encourage students to respond actively and thinkingly to what they read. They use a variety of approaches to encourage students to actually stop and answer these questions, but we are well aware that many students find it very tempting to leave these bits out and just read on without stopping; particularly if the answer is displayed on the same page and thus within easy sight.

The Potential of Audio-Cassettes

I want to turn now to audio-cassettes and consider their potential as a teaching medium. I shall be noting as I do so how often they have features which counteract the kinds of limitations to text I've been mentioning.

There have been studies, as you may know, which have set out to try and show that there is a kind of hierarchy of teaching media. They wanted to prove, that one medium could be said to be better in

some absolute sense, than others for teaching purposes. Life would be a lot simpler perhaps if they had been successful. But what these studies showed if anything, was that each and every medium can teach effectively in its own way. Teaching effectively then becomes a matter of using media responsively. It means being responsive to the teaching context, such as the nature and complexity of the subject matter being taught, or the teaching strategy being used. It includes being responsive to the learning context such as the likely abilities and needs of students, and, finally, being responsive to the media themselves - to their basic characteristics and to any unique features they may contain.

It is this final point I want to take up in relation to audio-cassettes as I go through what I believe to be their main characteristics and indicate how these can be exploited for teaching purposes.

What are these characteristics?

1. First of all audio-cassettes use sounds to communicate. But what sorts of sounds? Well apart from the teaching of music, most often what is heard is the sound of the human voice, so we need to consider its characteristics too. First and foremost the voice can be modulated. Modulation is perhaps best described as providing audible clues about the meaning of words and about speakers themselves. It includes variations in pitch, tone, pace, volume and emphasis.

   Now these clues are clearly helpful in an educational context. As I have already suggested, despite careful preparation a written

text can contain ambiguities - for example, written attempts at humour, included to lighten the teaching perhaps can be misinterpreted.

A spoken text on the other hand can add clarity to the meaning of words and phrases because a part of their meaning can be heard whereas it cannot be seen.

As well as adding clarity, the human voice can convey a sense of the speaker, and this is also valuable in a learning context. I have three examples. First, it can help to break down barriers between teacher and student, barriers which may be constraints upon learning. For example, many students regard teachers as authority figures, or as an elitist group whose ideas cannot be grasped by ignorant laymen like themselves. A sense of the teacher as a human being rather than as this authority figure is often well conveyed if students can hear his voice.

Secondly, the teacher's voice will often convey his enthusiasm for his subject-matter, and this can be very motivating for students to hear.

Thirdly a sense of the speaker is often very useful if students also have to read texts prepared by the same person. This often happens at the Open University, and many of our students say that they find it easier to follow what their teachers write if they have heard their voices. They claim that they often imagine their teacher is speaking the words they have to read

and that this makes their meaning clearer.

2. The second characteristic of audio is that it involves <u>just listening</u>. This means that students hands and eyes are free and can be used to carry out some related and relevant learning activity as they listen. Their hands and eyes are free to do quite unrelated tasks too of course - such as driving the car or doing the ironing. This is not a purely facetious point. It can be very useful to listen repeatedly to an audio-cassette and at different levels of concentration. For example listening to a tape to get the gist of its contents - rather as one might skim read a text first of all - or listening to a tape for revision can be done without students' total concentration. If they can carry out other domestic duties at the same time, they are far less likely to feel that they are wasting time and thus more likely to listen in these ways.

3. Thirdly, the spoken word can often <u>convey very quickly certain kinds of abstract information</u>. An adequate explanation of these same abstractions in writing, on the other hand, can take up several pages of print. This is, I think, often the case in mathematics.

4. The fourth characteristic of sound is that it <u>conveys its information over time</u>; this is unlike a printed text, which, as I said earlier, holds its information on constant display. Sound therefore can be very effectively exploited in the question and answer situation. If a spoken text includes questions to students, the answers to them are suspended from view, and not so temptingly

visible as on the printed page.

Moreover, it is more likely in our experience that students will comply with spoken instructions to stop and answer questions than with written ones. We have found too, that if we include a snatch of music between the question, the instruction to stop and the answer, that students are even more likely to stop and think before listening on.

5. The fifth characteristic of audio cassettes is their informality. Here my comparison is between audio-cassettes and other spoken media such as lectures or radio broadcasts. Tradition and professionalism tend to lend a formality to these two media which it is valuable to avoid in cassette teaching. Perhaps the most striking feedback we have from Open University students relates to their general enthusiasm for audio-cassettes which are directly spoken, and are personal even friendly in tone. These students, and they are the vast majority, place great value on the way an informal presentation can evoke the sense of having a one-to-one lesson with their personal tutor.

6. Sixthly, cassettes are a flexible medium. This is very important from a student point of view. It means students can decide when, how and where they listen according to individual need and preference. Even the cheapest cassette players have stop-start and replay devices allowing students these kinds of freedoms, and thus allowing them to study in

ways which most benefit them. The flexibility of the stop-start technology of cassette players is also valuable to teachers. It means that they can pick and choose from a wide range of teaching strategies. I want to give some examples of these in a moment. Before I do so, though,

7. there is a seventh and final characteristic to mention. It is that the design, even the rough production of audio-cassettes remains within the control of academic staff. Cassettes are not high technology involving great expenditure, time and expertise to make. Indeed they can be prepared quite simply, cheaply and quickly by almost anyone. The effort they involve is more a matter of careful organisation than anything. Where academics are using a mix of media what matters most is that each is well integrated into the teaching as a whole. Since the content and design of cassettes are within the control of academic staff, it is they who decide where and how cassettes fit into their teaching; they can insure that each cassette makes a telling contribution and does not become a fancy if professional looking, 'extra', to their course.

Examples

I should like now to give some examples of how the Open University has tried to exploit these 7 characteristics in its teaching.

We have used cassettes in four main ways.

1. Direct teaching
2. As support material - either to other components or to students themselves
3. As an audio resource
4. For delivering straight talks.

I want to say a little about each. First then, Direct Teaching.

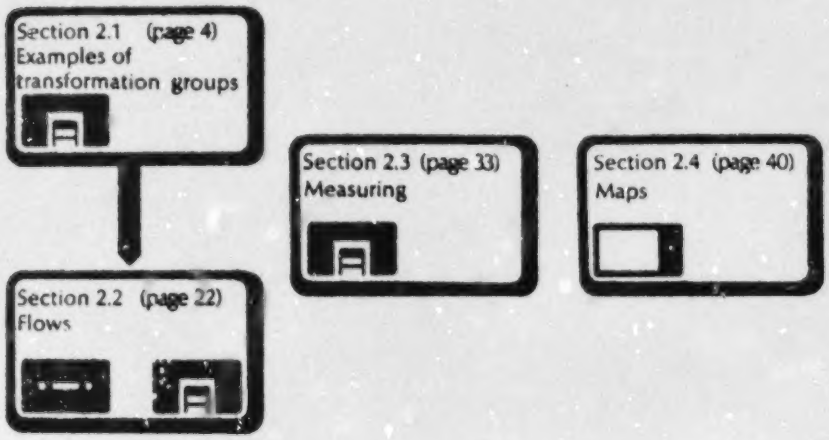
In a moment I shall play a short extract from an audio-cassette on a Mathematics course called Introduction to Pure Mathematics. I choose this example because the Maths Faculty did much of the pioneer work at the Open University in developing effective ways of using audio-cassettes in combination with visual material. The extract illustrates many principles of good design and organisation which are relevant to any discipline, and not just to mathematics teaching. The example is also interesting because on this course, audio-cassettes share the teaching, more or less equally, with the printed text. Thus cassettes are used for variety as well as for their special teaching potential. Their importance is stressed by the fact that the visuals which accompany the sound are bound into the main teaching text and thus share its status as a major teaching component.

If you look at the next page you can see how the course is organised and how students are informed of this organisation.

CONTENTS AND INTRODUCTION

In the previous unit we described various mathematical concepts which arise from the ideas of space and rigid-body motions in space. In this unit we look at a little of the mathematics which arises from a consideration of more general motions.

There are four sections in this unit; they are related as in the following diagram:



In Section 2.1 we look at several examples of transformation groups, including more examples of symmetry groups and also some transformation groups which are not symmetry groups. The section ends with an example of a 'flow'; sketching of simple flows forms the content of Section 2.2, the tape section. Section 2.3 is concerned with a more detailed examination of the idea of *measuring*—not only of straight lines, but also areas and curved lengths. The TV section, Section 2.4, examines an old problem—that of *mapping* the surface of the earth, i.e., representing it on a (flat) piece of paper.

This unit is more diverse than *Unit 1, Introduction I*, the different topics being only loosely related. However, all the ideas introduced here will be developed in later parts of the course, especially in the Analysis and Topology units.

Figure One

(Reproduced from M203, Unit 2. "Maps and Flows")

At the start of each volume of text - or unit as we call it - students see a page like this. It is a flow-chart showing when and what each medium will be teaching. The symbols in each box represent a particular component. The desks here and here represent a period of text reading. The television programme here is about 'Maps', and the cassette component is devoted to the concept 'Flows'. Each of the boxes gives a page reference indicating when the compcnent will be used. I have a copy of page 22, the page mentioned alongside of the cassette symbol here.

SECTION 2.2 FLOWS

Before listening to this tape you should have read Section 2.1. The concept of the *slope of a line* is used throughout this tape, so here is a brief reminder of this concept.

If we have a line in the plane, then the *slope* of that line is the tangent of the angle that the line makes with the x-axis. For example, in Figure 1, the slope of the line AB is $\tan x$.

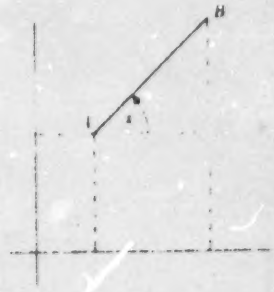


Figure 1

In Figure 2 we have drawn a few lines through the origin and given their slope. For example, a line making an angle of $\pi/4$ with the x-axis has slope 1 (because $\tan \pi/4 = 1$), whilst a line making an angle of $3\pi/4$ with the x-axis has slope -1 (because $\tan 3\pi/4 = -1$).

In this tape we shall adopt the convention that any line perpendicular to the x-axis has slope ∞.

Start the tape when you are ready.

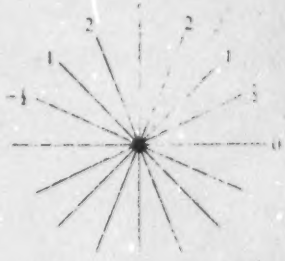


Figure 2

Figure Two

On page 22, notice how the cassette symbol occurs, to remind students that this is where they will be listening as well as looking. Students are also given a brief written introduction to the cassette, again to organise their sequence of study. Here they are told that they should have read the previous pages of text before they listen to the cassette.

10 pages of visual material related to the sound track follow page 22, all looking rather like those on the next page. (Figure 3)

Before I turn on the tape, I should like you to notice the clear borders, blue on the original, and numbers given to these visuals. They are referred to as 'frames' by the commentator, and each one is intended to function rather like a paragraph of print. It thus contains one basic idea or point. We pick up the commentary about Frame 3.

(At this point we listen to an example)

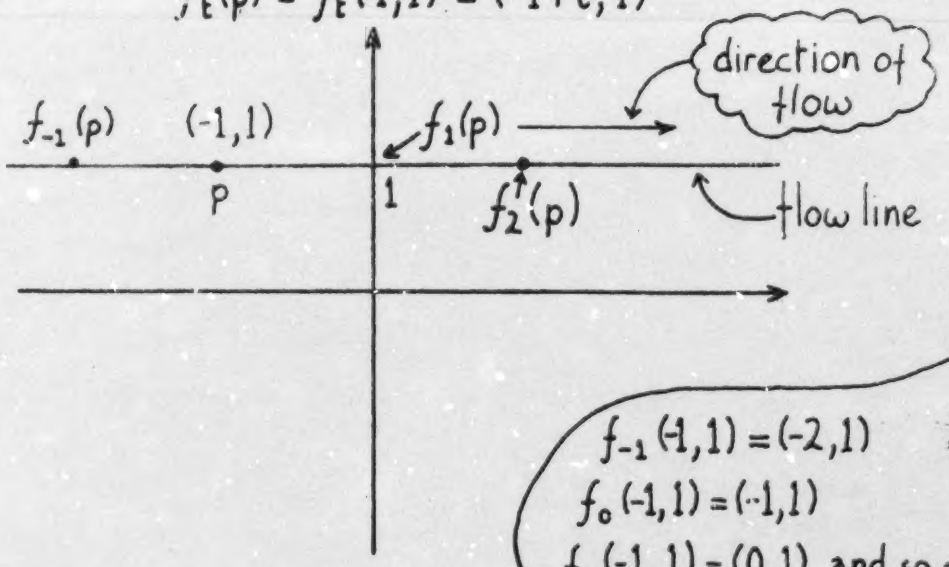
EXTRACT 1.17 MINS. M203, CASSETTE 2.2 "FLOWS"

There were a number of features about this example which need comment.

First, the frame layout. It may look casual, but it is very carefully designed with expert graphics advice. Each frame is laid out so that the commentary ties in with the natural reading movement of our eyes - left to right, and top to bottom - Secondly, sound is used to lead students eyes forward so that they focus briefly on the words, symbols or

2 Flow lines

$f_t(p) = f_t(-1,1) = (-1+t, 1)$



3 A river

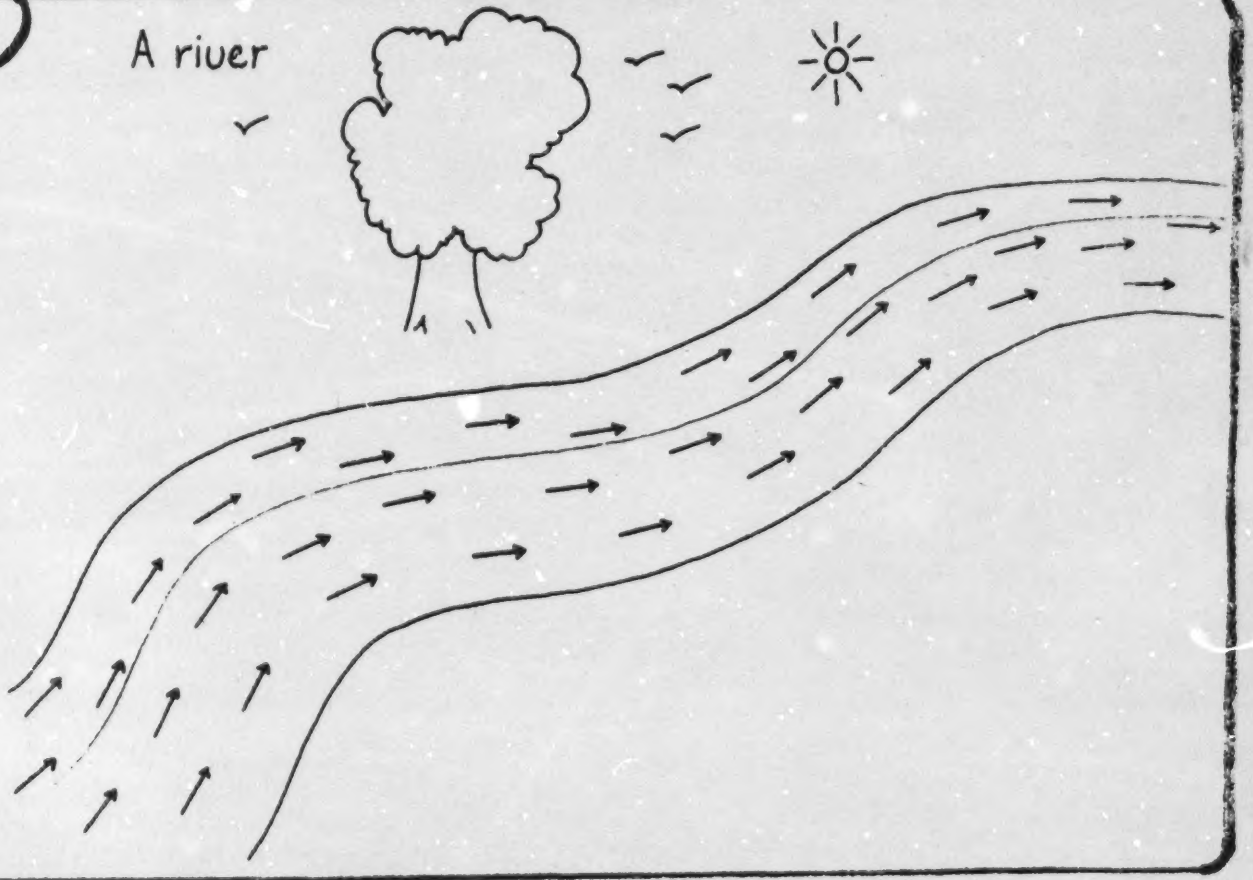


Figure Three

images referred to, and these images or words represent the key points in each lesson. Thirdly, there is a great emphasis on informality in this kind of cassette. One of the main reasons audio was used here was so as to humanise or lighten the teaching of mathematics. The commentator therefore speaks directly to students - and the visuals complement his informal style by using hand-written words and even a cartoon - like professor.

The part of the cassette we heard involved students in just listening and looking. Later they have to stop the tape at various points to carry out certain calculations so as to practice and revise what they have learned.

I should like to show you now two visuals from another Open University course, one in Basic Technology this time. On this course there is an audio-cassette related to the concept of Energy. Here the direct teaching on cassette also involves questions and answers but of a rather different kind from the revision questions on the Maths example. The visuals are used differently too.
The sound this time leads students through a series of photographs like the one on the following page. (Figure 4)

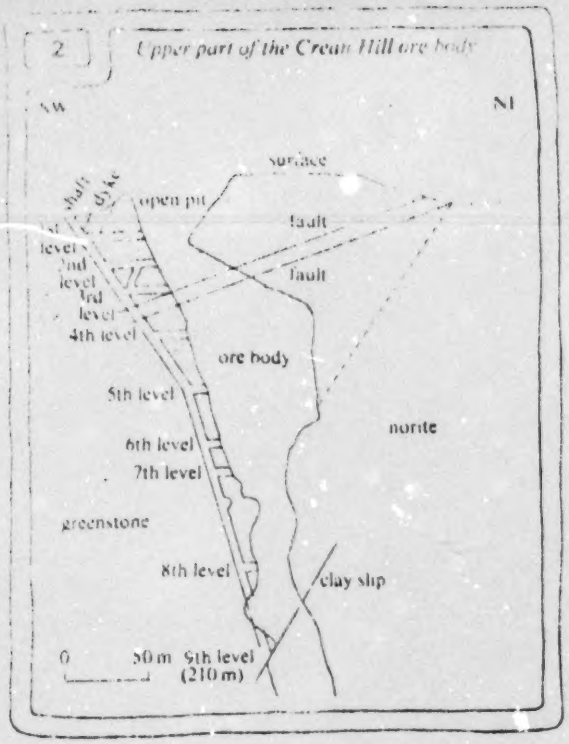


Figure Four

(From T101. Living with Technology)

The photographs have three functions:

1. They are discussed in terms of the evidence they provide.
2. They aim to bring a touch of reality to the problem under discussion, which is "Where does Energy go?"
3. They are linked to an exercise which students carry out during the programme to solve this problem about energy.

The exercise has its own visual material, it appears on the first page and looks like Figure 5 on the following page.

Now at various points in the lesson students are asked to stop the tape and to fill in one of these answer boxes. They need to do short calculations and to apply the evidence in the photographs to complete each box. There is a difference between this kind of activity and the ones on the mathematics cassette. Here the activities aim to break down a problem into easy stages. Students do not do the whole exercise at the end, for revi ion and to test their comprehension, instead they attempt it piecemeal and under the direct verbal guidance of the commentator.

I think this audio-cassette illustrates well how effective it can be to listen and look simultaneously and to have a guiding voice over your shoulder as it were, to help you solve conceptual problems. Other OU cassettes use a very similar technique to guide students through other activities and to help them develop a variety of skills. There are cassettes in the sciences for example which help students to become practiced at identifying features on maps, or at identifying the structure of geological specimens. During others, students carry out home

Audiovision Package 9

Copper: Where the Energy Goes

The audio component of this package is:
Cassette 4, side 1.

The visual component is the following set of illustrations.

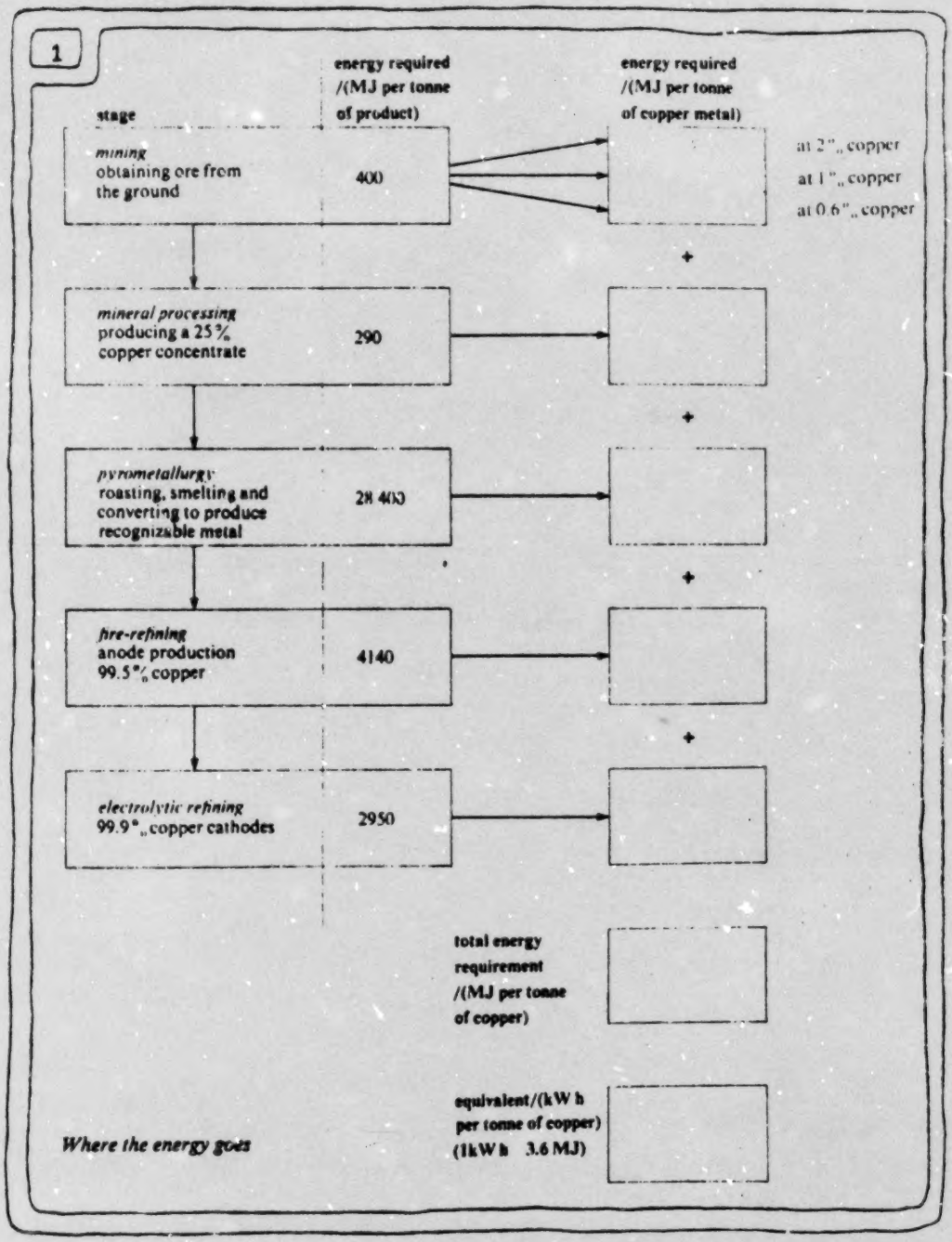


Figure Five

experiments and again under verbal guidance observe chemical changes taking palce in solutions. In both the arts and sciences students often look at colour film strips and follow their tutor's analysis of paintngs or other artifacts. In the social sciences, cassettes are used to help students interpret sets of figures and statistics a task which they find rather daunting in print without that friendly guiding voice. They are also used to help students to learn how to prepare graphs and statistics for themselves.

Let me recap here on the examples of direct teaching I have mentioned so far and consider how the teaching they provide exploits some of the characteristics of audio-cassettes.

We have seen the stop-start characteristic of cassettes used to intersperse questions - for revision or for comprehension. We have seen the stop-start approach used again to intersperse activities which develop or provide practice in skills such as interpreting visual data, doing experiment work or preparing graphs. We have also seen the stop-start technique with activities or questions interspersed to break down problem solving into easy stages. We have seen the sound feature exploited to provide students with activities which they carry out as they listen again so as to develop various skills and to provide practice in them. In each of the examples too, the teaching was relatively informal, the commentator spoke directly to students, for example.

Now a point worth bearing in mind when preparing these kinds of interactive cassettes is that they need careful organisation. Students instructions need to be very clear and the pace of any simultaneous looking or doing activity must be carefully gauged to tie in with the commentary. Indeed it is advisable to try out a draft version on a colleague or a small group of students to make sure that it is adequately clear and appropriately paced. Before leaving direct teaching cassettes I have one more example which exploits even further the informality of the medium - so as to provide support to students as they develop new skills. The cassette is from another Technology Course, and on it students are taught how to draw diagrams. The tape begins by asking students to look at this rough diagram on the next page, Figure 6.

What the tutor then does is explain his thought processes as he drew it; so he takes them through the diagram item by item showing how he changed his mind here and there, and how he began to sort out which items were more important than others. By the end of the cassette of course, students are looking at a very smooth and professional looking diagram. At this stage though, when they themselves perhaps feel insecure and don't know how to begin, it is encouraging and supportive to see a tutor's starting point. It is I think a very imaginative way to use audio. It illustrates tellingly how intimate the medium can be, and how it can allow students to gain a sense of their tutor as an ordinary person and not just as the gifted expert who has always known how to draw a good diagram from scratch.

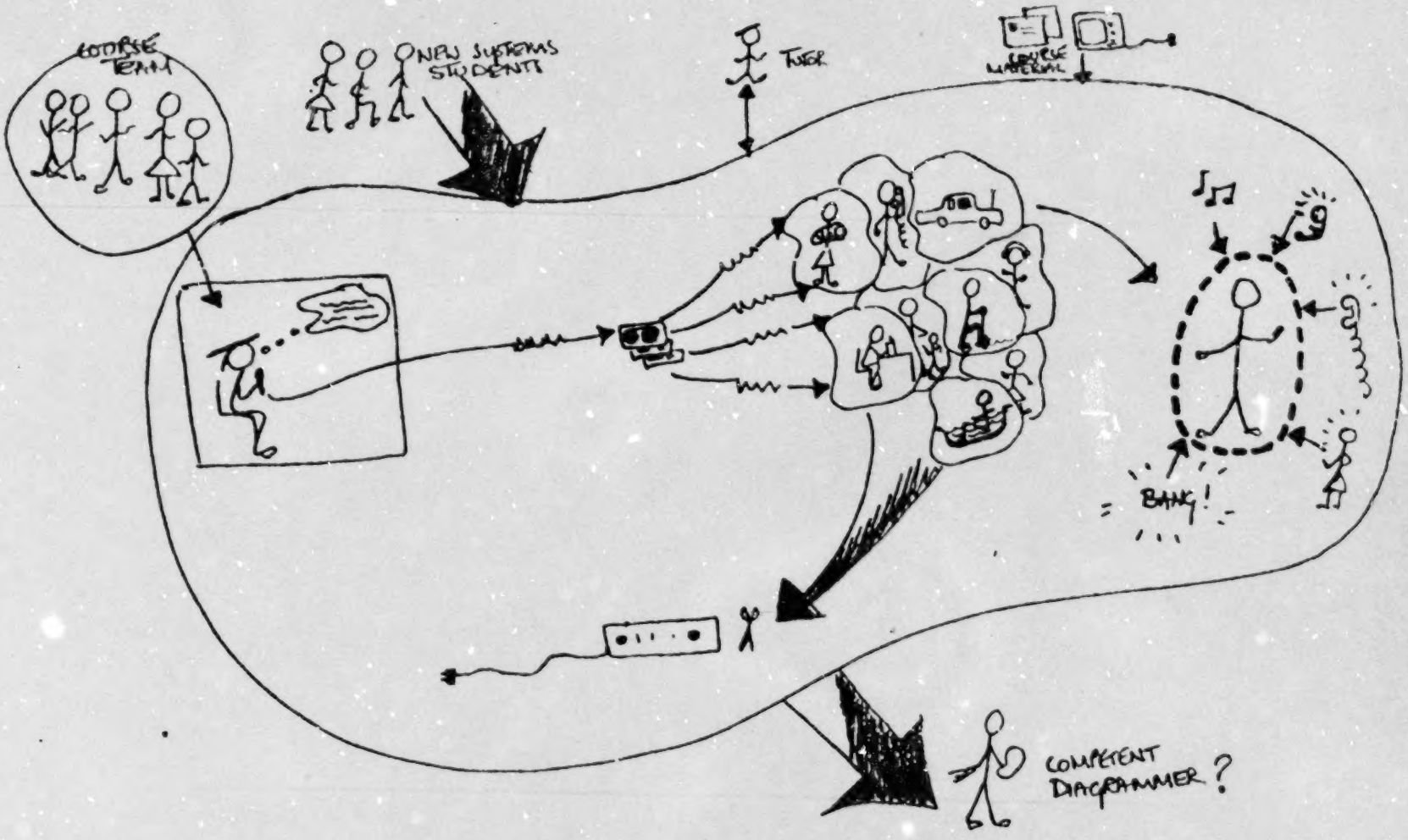


Figure Six

Figure taken from Cassette Notes for
Course: T246, "Human Systems"
Title: Diagramming

I want to say a little now about the remaining kinds of audio-cassettes we use.

In group 2 I said we use cassettes to provide back up material to other course components or to students themselves. For example we use them to help students to analyse television programmes or certain set readings. We use them too to advise students on study methods, such as note-taking, essay writing or revision for examinations. They are used in sum to provide guidance and encouragement of a personal kind and at points in the course where students might be having special difficulties. I include in this group tapes made on the initiative of individual tutor - tapes a regional tutor might make rather than course designers. For example, some tutors send recordings of tutorial meetings, or a taped summary of such meetings to absent students. Some tutors use cassettes to provide special back-up to students' written work if there are special problems.

The third group of cassettes provide students with audio-resource material. These range from straightforward glossaries of technical words to show how they are pronounced, to recording of real life situations - for example of children at work in the classroom or of parliamentary speeches - students can use these recordings as extra material for them to analyse if they wish.

The fourth group of audio cassettes contain straight talks. This is the most traditional format and in institutions apart from the Open University, it is probably the most commonly used.

At Fernuniversitat, West Germany for example, most cassettes are of this type except for those teaching languages. The Open University uses them occasionally with the aim of developing a more long-term and sophisticated view of learning than is perhaps typical even of university students. They are used primarily to enrich the essential teaching; so, for example, they may provide alternative academic perspectives on the subject matter of the course. Students just need to listen and enjoy these talks; they are perhaps the type of cassette which many students consider somewhat irrelevant, but often listen to them because they can do other and probably quite unrelated things at the same time!

This has been a rather sketchy overview of the ways we use audio-cassettes at the Open University, but I hope that it has given you a flavour of their potential and perhaps helped to suggest ways in which they may be useful to you. Cassettes have proved so popular at the OU, with both academics and students, that we are always looking for new and creative ways to exploit them. But in order to help faculty members who have not made cassettes before we have also prepared a self-instructional package which contains advice and guidance about well-tried approaches to cassette teaching.

It consists of short extracts from OU cassettes recorded onto one tape and interspersed with a commentary on their good and less good design features. With this tape there is also a range of examples of the kinds of visual materials which have been used together with the sound extracts. The package has I think proven an effective way of disseminating our accumulated experience and ideas since it is simple to use and copies are available to academics as and when they want some advice. It is the kind of back up I would recommend to any teaching organisation which was thinking of making many audio-cassettes.

Video Cassettes

Let me now turn to video-cassettes. In this section I describe the content and structure of one O.U. video, and comment upon students' use of this component. I consider briefly other ways video might be used in education and note some of the major differences between video and audio-cassettes.

Let me just clarify one point first of all: video can mean two things either recorded versions of television programmes or video programmes designed from the outset for use as video. I shall just be talking about video made as video; so I shall be pointing out the educational potential of video cassette technology as much as the potential of using a combination of moving images and sound, which is, after all, the essence of both television and video.

The Example

The video example I discuss contains scenes, recorded from real-life, of schoolchildren doing mathematics. Students thus watch and listen to some children as they set about tackling some problems in subtraction.

The video comes from a course called "Developing Mathematical Thinking". This is a course primarily aimed at teachers who are interested in the problems of teaching and learning mathematics, and as it happens most of the students who take the course are teachers, though not all of them are currently teaching.

The course is divided into 8 topics which are taught by a mixture of components: text, video and audio-cassettes and some student project work. As usual, it is the text which does the major part of the teaching, but these other compoents are very closely integrated with it.

Why use Audio-Vision?

The course designers wanted to use videos to show students classroom scenes for three main reasons.

- First, these scenes provide all students on the course with one and the same experience - an experience therefore which all students can focus upon as they study the course; without this focus students might have relied on their individual and perhaps very different classroom experiences as teachers and have become sidetracked by these.

- Secondly, the main text uses these scenes to illustrate points and as evidence. So it refers to incidents in them on several occasions.

- Thirdly, the live action was intended to stimulate students' own ideas about the ways children might be helped to develop their mathematical thinking. In this sense the videos lead into the text and into the direct teaching. They are intended to stimulate interest

and to provide food for thought as much as anything. So students are not expected to be able, nor are they asked, to analyse them in the light of taught theory - it has not been taught yet! What happens is that later the text takes up any vital point in the videos and explores them in depth.

Why Video and not Television?

The course designers wanted to use video rather than television, the usual Open University choice, because they wanted students to be able to watch several short sequences of audio-vision rather than one long programme. They believed that this would be less tiring, that it would help concentration and provide an ideal resource for group work. They thought that group work would be popular, especially with teachers, who have often used this way of studying as part of their professional training.

Because enrollment on this course was largely from teachers, it was feasible to think in terms of using video rather than television. The course team knew that most schools were equippped with video-cassette players and many students thus had access to necessary replay equipment. The videos themselves were made available in two ways. They were broadcast on T.V. but merely for students to copy and record for later use. They were also available on on a four week loan basis from the University centre. I said that many students had access to replay equipment in their schools. Of course, not all did. Some of the remainder owned their own equipment and could therefore be thought of as well-catered for. However, the course team strongly recommended that students did not watch the videos alone, but that

they formed small groups to view and then discuss them together. Thus, even students with their own cassette players and certainly those with no home or school video equipment were encouraged to join in group viewing sessions, rather than to make their own private arrangements.

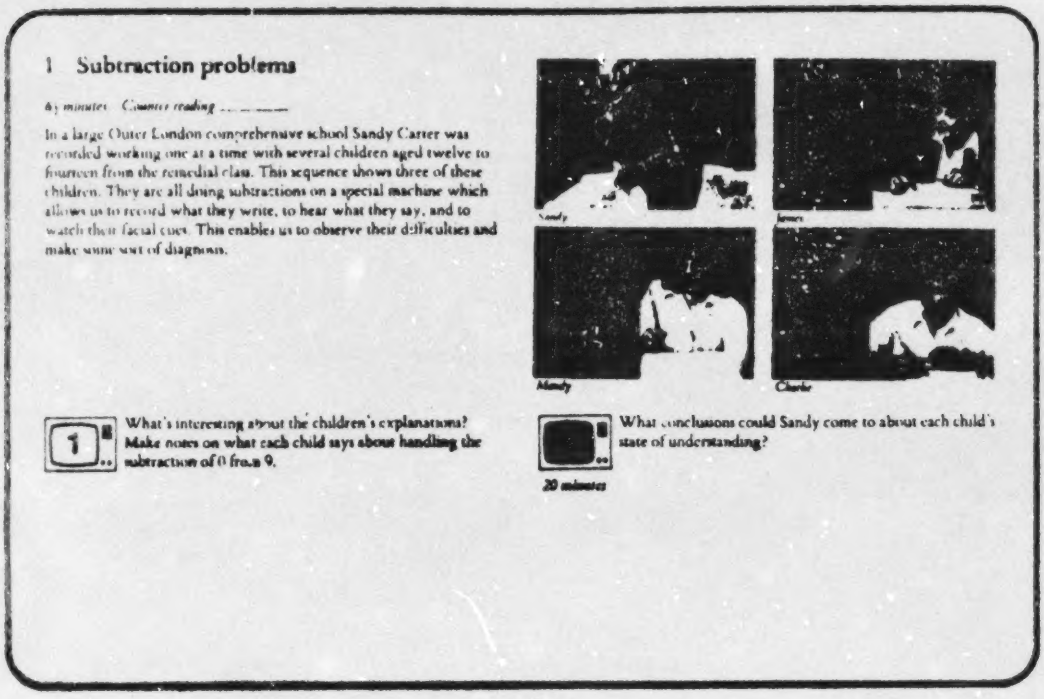
About half the students on this course followed these recommendations. They chose mutually convenient viewing locations and shared its facilities. They met roughly every two weeks in line with the schedule suggested by the course. The other half of students studied alone, either from personal preference or because they lived too far away from other students to make meeting practicable. I shall be discussing later what differences there were between students' responses to video work and will show that these differences were largely dependent upon whether they watched alone or in groups.

Video Structure

But first of all, some final points about the video example I am discussing: the example is an extract taken from the first of the videos made for the course and it deals with the topic of subtraction; the whole programme runs for roughly 23 minutes as do all the eight cassettes made although each programme forms the basis of a two hour study period.

Each video programme and thus each study period is structured round 4, 5 or 6 sequences showing different children usually tackling different problems. The sequences are quite short - sometimes only 2 minutes in length never more than 7 minutes. Between each sequence there is a clear 'stop' to the programme, a flashing star-shaped symbol in the top-right corner of the screen, together with the printed words "Review-Discuss".

There is further structure to the viewing session - and this comes in the form of notes like the ones below.



1 Subtraction problems

6½ minutes Counter reading ... ...

In a large Outer London comprehensive school Sandy Carter was recorded working one at a time with several children aged twelve to fourteen from the remedial class. This sequence shows three of these children. They are all doing subtractions on a special machine which allows us to record what they write, to hear what they say, and to watch their facial cues. This enables us to observe their difficulties and make some sort of diagnosis.

1 What's interesting about the children's explanations? Make notes on what each child says about handling the subtraction of 0 from 9.

What conclusions could Sandy come to about each child's state of understanding?

20 minutes

Figure seven

Reproduced from EM235 "Developing Mathematical Thinking"
Topic One "Subtraction"

This is the kind of information students are given about each video sequence. It provides them with:

- brief background information
- a photograph from the video sequence
- practicalities such as, the length of the sequence, a space for taking a counter reader
- questions to think about or jot down answers to while viewing and points to focus on. (Notice the screen to the left of the the notes is 'on'.)

- o questions to try and answer after viewing. These are questions of a more general nature intended to stimulate discussion and thought. (The screen to the right is 'off'.)

(At this point we viewed an extract stopping at the flashing symbol.)

We found that the flashing stop signal worked well. Unless students were in a great hurry and just wanted to skim through the remaining sequences before rushing home for example, they did stop at these points. Indeed, if they let the cassette run on- they see a blank screen followed by a completely different scene with different children. As a result, our students tended to think of the videos as containing five or six different programmes rather than as being one programme containing different sequences closely related to each other.

There was a third kind of academic structure to this video, (I have already mentioned two, the notes and the clear stop-start to the programme) the third was the occasional use of voice-over-directions to students; these usually tell them to focus upon particular words or actions. One interesting fact learned from talking to students who used these videos laster year, was how little attention they said they paid to such voice-over directions. Some students claimed not to hear them at all, others said they found them distracting. They claimed that they were kept very busy just in concentrating on the wealth of information in the words and actions of the children themselves and wanted to study and enjoy this information without intrusion. It was, generally speaking, only those students who watched alone who eventually spotted and used these academic guidelines. I say eventually, because they usually did not notice them at a first viewing, but only as they replayed the sequences to study its content in close detail.

Differences between Groups and Individuals as viewers

This leads me back to my earlier comment about students' responses to video. There were marked differences between the ways individuals and groups of students used the video material and in what they thought they learned from it.

This diagram shows, rather crudely, what the differences were;

	INDIVIDUALS	GROUPS
1. STOP/START	✓	✓
2. REPLAY	✓	X
3. ANSWER ▭ QUESTION	✓	X
4. ANSWER ▬ QUESTION	X	✓
5. CONFIDENT	X	✓

1. The only thing the two sets of students have in common is the first point. Students of both types stopped the tape when indicated to do so by the flashing symbol.

2. My second comparison is about the replaying of cassette contents. Individual students spent much of their two hour study periods in replaying. They replayed parts within each sequence and the sequences as a whole. Groups of students on the other hand, only replayed parts of a scene if there were arguments between members about what exactly had been heard or seen. On the whole, this was rare, as by talking over disagreements with each other a majority view usually emerged to settle the debate. There is one exception to this general finding; we did learn that groups of students would usually replay the whole

of any very short sequences - those of up to 2 minutes in length. This general difference in behaviour though becomes significant if we look at the next sets of comparisons.

3. The third comparison relates to the question or note-taking activity students were given to tackle while viewing each sequence. Individual students did tackle these. Indeed this is what students working alone were trying to do as they replayed their cassettes. Quite patently, neither kind of students could simultaneously make notes in any detail or try to answer questions and watch the video at the same time. The choice was between making very sketchy notes and watching closely, or making lengthy notes and missing a lot of visual information. So individuals set about solving this dilemma by going back and forth in the video until they had both seen it all and prepared what they believed to be adequate notes about it.

Groups of students simply didn't bother. Some jotted down the odd word as they watched but that is all. They relied on the discussion afterwards, and thus on their pooled memory of what was seen and heard to reconstruct the video in sufficient detail for them to move straight on to broader issues. Indeed, it would have been very awkward in a group situation if one member had insisted on much replaying, and had interrupted the others viewing in this way.

Again, this difference becomes more significant if we look at the next point.

4. In point 4, I compare students' responses to the broader question given for discussion after viewing. Individual students rarely tackled this, the main suggestion from the course team for an after viewing activity. Most of them tried but did not feel able to handle it. The question was usually very open-ended and single students found it hard to formulate an opinion on it.

Groups of students on the other hand, were able to use the social context to exchange opinions and ideas about the general implications of what they had seen and heard. Several times they did not need to refer to the question given to set the ball rolling. The discussion evolved in a natural way, as students instinctively expressed their responses to the real-life problems they had been focussing on. If discussion began to run dry, or if there was no immediate response, these students then looked at the question given and used it to revive or begin an exchange of views. There is no doubt in my mind that although the vivid real-life scenes on video provided a splendid catalyst for thought it was the group interaction which made the experience fruitful. Individual students had no-one to bounce ideas off and thus felt stuck with just one response and one they often felt insecure about.

5. This leads me to my fifth difference, my point about confidence. Individual students lacked confidence about their video work. They knew they hadn't really got to grips with the main question, and were left just with their detailed notes as a record of the content. They tended to realise that there could be more to video work than making such a record but did not really grasp that the main question was not intended to be answered in any very factual or precise way. Usually, they lacked the confidence even to offer an instinctive opinion as an 'answer' and rarely trusted any opinion that they did formulate.

Groups of students had a clear advantage here. By having an opportunity to respond instinctively and exchange views, they were eventually able to express a group opinion in answer to the broader questions posed. They thus had a reasonable basis for believing that they had done what was required of them and for feeling confident about what they had learned. They also felt confident because they could see that the discussion itself was worthwhile, even if it didn't really tackle head-on the questions given. They quickly realised that the text would later take up and explore any vital points in the video, and so it did not really matter if they had missed something. In other words, unlike individuals they did not at this stage seek 'right' answers - in terms of what the text might later say was 'right', - but enjoyed and felt stimulated by an open-ended exchange of view.

Implications for future videos

What are the implications of these differences for the design of other videos? I think they suggest that there are two main routes for video work.

1. First, I think we have a clear example of how well a particular type of programme can work as a catalyst for group discussion. In the example I showed, the scenes from real-life were I think very convincing. The close-up camera work on the childrens' faces, for example, very effectively conveyed a real sense of the problems they were having. The scenes also provided the necessary kind of emotional trigger for discussion to follow. Students working in groups responded, therefore, both instinctively and with understanding, to the scenes they had watched; and they were able to say something constructive about the ways childrens' mathematical thinking might be developed.

It is worth noting too, that this video achieves an aim which previous OU television programmes of this type did not achieve. It was, I think, important for students to be able to use the video's structure so as to concentrate on short sequences, one at a time, and to respond to them immediately afterwards in a group situation. It was valuable too for students to be able to go back and to replay small sections where there was disagreement about what had taken place. None of these features apply to television viewing - since even group viewing of television can be difficult to arrange, unless, by chance, the programmes are transmitted at an hour which is convenient for all students who want to meet together.

As a consequence then, of cassette technology itself as well as because of the particular type of programme the videos presented, students did something rather special. They were helped to think independently and constructively for themselves. This achievement is qualitatively quite different from being able to practice certain skills or to apply knowledge, which has already been taught by a related text.

2. The second route for video design suggests itself because of the way individuals used their cassettes. We saw how willing individual students were to use the cassette technology to go back and forth through the programme and to make notes about it. This suggests that videos which are designed to exploit the stop start technology rather more than our example did, will work well, but for students to work on alone rather than in groups. Thus, there is the potential for using video to present the kinds of highly structured and interactive teaching material that I have described in relation to audio-cassettes. We have learned too, that the use of voice-over questions or voice-over guidance to students, about where to focus attention do not work well on a single viewing. If such guidance or questionning is important, it will need to be supplemented and underlined in some way - perhaps by freezing the action on screen while the instructions are spoken, perhaps by printing the instructions on the screen itself.

At the moment, however, the potential for individual video work is unlikely to be exploited, at least in the OU context. Until most students can be expected to own their own equipment and until the production and distribution of video material becomes much cheaper they are not a viable proposition.

Differences between audio and video cassettes

I think that there are dangers in assuming that these two media are so similar that they will chieve the same kinds of aims and be equally successful educational tools. Clearly, there are similarities, in that both present information in a cassetted form but the differences between them are important ones. They lead me to consider that audio-cassettes, at the present at least, are the more valuable medium.

The 5 main differences to bear in mind are these.

1) Many students appear to find video a more formal medium to work with than audio, and feel less comfortable working with it. It lacks apparently the very personal and intimate quality that students using audio-cassettes praise so highly.

2) Students also seem to find video technology rather more intrusive than the small and very simply operated audio-cassette player. For this reason too then, students feel less at home with it and less the master than the tool of the technology involved.

3) Thirdly, video work presumably involves watching as well as listening. Much of the meaning of a video presentation should be in its moving images, otherwise, why use it at all? This means that students are less free to carry out some of the activities they can so usefully perform as they listen to an audio-cassette. They can't do any of the less relevant things simultaneously either of course - I should hate to think of students driving their cars and watching a video at the same time, though, as I said earlier, this was perfectly possible with audio-cassettes.

4) The fourth difference relates to their relative convenience. Quite clearly, until most homes do have video cassette equipment video study cannot be described as very convenient. Most homes do have audio-cassette equipment already, and they are therefore a readily exploitable resource.

5) My fifth point is my final one. From the academic's point of view, the preparation of video material is quite a different proposition from the preparation of an audio-cassette. An audio-cassette is simple and cheap to make and need not take much time. It can be made in your own home and by anyone using a little common sense. Their contents and design can therefore remain largely a matter for the individual teacher - he decides, he controls their production. The opposite is true of video.

Video is expensive to make, needing high capital outlay for overhead equipment alone. Moreover, it takes professional expertese to produce a video of adequate teaching quality and outside assistance will be necessary for this reason alone. Academic staff, therefore, are very unlikely to have complete control over the design and production of video material.